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PUBLIC AWARENESS ON ELECTROMAGNETIC FIELD IN MALAYSIA

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ABSTRACT

Electromagnetic field (EMF) can be categorized as non-ionizing radiation (NIR) and known to be hazardous since it has ability to induce health effects to the exposed person if amount received is excessive. The wide spread of EMF relevant technologies related to microwave, radio frequency, extremely low frequency electromagnetic field (ELF EMF) contributed more electromagnetic fields to the environment and bringing out worry to the public as it has been related to the health issue. The misunderstanding on EMF facts has spread out by the public and has created big issue due to the wrong information and facts. We have conducted several safety assessment and talk on EMF awareness among the public. The objective of the safety talk was to make the public understand of basic knowledge on NIR and to advise them on the outcomes of the assessment base on recommendation of the standard guidelines issued by the International Committee on Non-ionising Radiation Protection (ICNIRP). We emphasized on EMF basics, effects, safety guidelines and exposure limits for workers and public to make the public understanding on EMF radiation better. In this paper, we also will highlight the results of safety assessment conducted at two locations which exposed to the ELF EMF.

INTRODUCTION

As we are living in modern world, we cannot avoid the electromagnetic field. It is including the extremely low frequency electromagnetic field (ELF EMF), radio frequency (RF) and microwave (MW) which came from the electricity system, mobile telephone base station and others. The operator of the system erected their facilities near the housing area, shop lots, school, and commercial area to cater the increase of demand of the technology. The electromagnetic emitted by the system made the uneasy feeling by the public living near by as it has been reported to cause health effects such as insomnia, cancer and many more. Many issues had been raised by the public due to the wrong information, unclear facts and confuse assumption. Due to this, Malaysian Nuclear Agency has take the responsibility to make things clear and explain the true facts by doing on field safety assessment referred to the international standard.

A series of public talk, forums, road show has been conducted to communicate on basic understanding of EMF exposure. In this paper, we will highlight ELF EMF only.

Electromagnetic Fields Issue

Many research has carried out on electromagnetic effects to the human beings. The concern over on the magnetic fields began in 1979 when a case of controlled epidemiological study of childhood leukaemia carried out in Denver Colorado. Since then, numerous epidemiological study and laboratory work were conducted aimed at clarification of the finding on the matter concerned. Regarding to that, many issue has raised regarding the relationship of electromagnetic and health effect.

Public awareness must be highlighted to make sure public aware about it especially for those living and working near the EMF sources. When the public complaint, government agency has to take action and make the public understand the real situation as this could lead to a bigger issue. As now information could easily spread through the internet, newspaper and other media, we have to make sure that public get the right information. Road shows, seminar, talk has been carried out not only to public but also to the workers who directly involve with the EMF source.

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Public Awareness on EMF

In the past of 8 years, more than 50 events of seminars, public talk and in-house training on electromagnetic has been conducted which including the extremely low frequency electromagnetic field (ELF EMF), radio frequency (RF) and microwave (MW). Besides that, we also took part in science exhibitions to share the information and our activities handling the EMF issue which is directly related to non-ionising radiation. The public talk usually requested by the local public council or local authorities due to public demand. In order to make it effective and satisfy the public, safety assessment was conducted and during the talk, results of the safety assessment will be presented.

The public talk normally conducted when people living near the electromagnetic source complaint and raise issue of getting health effects such as dizzy, insomnia and sometimes they claimed that some of them were suffering from cancer and skin disease. This is a serious matter which must be handle carefully because it involve of health issue of public. Their perception towards the issue would create bigger issue which will be published in media and spread fear and uneasy feelings among the public member.

Besides public talk, the information also has been shared among the workers who directly involve with electromagnetic source such as telecommunication tower staff, manufacturing plant workers and others. They should aware about the risk working near the electromagnetic sources. In order to make them ready and aware about the risk, the employer have to provide knowledge, information of risk and safety precaution to their workers. Besides information, safety assessment also has been conducted base on their needs in order to confirm the EMF level that has been exposed to the workers. The results of the safety assessment will be presented to give the real picture of what the experience during their duty. From there, we could advise the company base on the facts and results of the assessment to make sure they provide conducive and safe environment to the workers.

Property development has become very rapid in recent years. Some of the properties located adjacent to the transmission line and mobile phone base station. This is in line with the demand of the electricity supply and technology in telecommunication. As now people more concern towards the EMF, living neat the EMF source is not a wise decision. Location factor contributes to the selling price of the properties, which is reflect to the developer company revenue. To convince their potential buyer, they have to provide information such as the EMF level and basic knowledge about the EMF. We had conducted several talk and meeting with the management of the company to advise them regarding this issue as requested and followed by the safety assessment at the area of concern. Based on the results, we would advise the company on the outcomes of the survey based upon the recommendations and exposure limits of the standard guidelines issued by international Committee on Non-ionising Radiation Protection (ICNIRP).

Hazard and Recommended Permissible Limits

Electromagnetic field is a form of energy that travels in space as electromagnetic waves namely the electric field and the magnetic fields. In spite of the fact that ELF EMF are very weak energy of electromagnetic emission with limited ability to cause side effects as described above, it is widely reported that the emission is hazardous to human health. Besides having low energy and, ELF EMF known to have capability to induce current in human body when exposed directly to them. However, it has been discovered that such induced current formed is very small, several orders of magnitude weaker than those natural currents induced by biological electric activity of the body (Tenforde T.S. 1996). Direct biological effects leading to cell death, gene mutation or transformation are, therefore, highly unlikely with these fields and, in fact, have never been observed before (Mc Cann J et al 1993). Its hazard is usually associated with generation of induced current in the body, thermal effects on the nervous system including cancer in long-term. The effects are more pronounced if the exposure received is acute and excessive. However, the effects resulted from exposure to the fields at low-levels, like the one experienced in most work places, is still uncertain due to the fact that all scientific evidences gathered so far are not conclusive enough to link it with any effects (WHO/193 1998, ICNIRP 1998).

The real agent of causing the problem is suspected to be the magnetic fields since electric fields can easily be absorbed by any object, such as walls and floors of buildings, trees, etc. Even with the magnetic fields, most studies carried out previously indicate that the strength of ELF EMF routinely present in public settings or work areas is far too low to directly affect the body.
Many countries and international organizations have adopted the International Commission of Non-Ionising Radiation Protection (ICNIRP) limits into their respective national and international safety standards and

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legislation and an example of these countries and international organizations, which include World Health Organization (WHO/182 1998), International Labour Organization (ILO) and the European Committee on Electrotechnical Standardization (CENELEC 1995)[9]. Based on these guidelines, the occupational and public exposure limit for electric and magnetic fields of ELF EMF are 10,000 V/m and 5,000 V/m, and 5000 mGauss and 1000 mGauss respectively [4].

Safety Assessment

Onsite safety assessment is very important to prove that the area concern are safe to and the level of the electromagnetic are below the recommended safety limit. This paper will highlight two safety assessment conducted at the housing area adjacent to the transmission line and substation (Location 1 and Location 2). The objectives of the survey were to determine the presence of extremely low frequency (ELF) electromagnetic fields (EMF) generated by the high-tension overhead cables next to the area of concern and to assess the potential ELF EMF exposure received by future residents living in the area of concern. The study would focus on assessment of potential exposure hazard caused by extremely low frequency electromagnetic fields (ELF EMF) present on the property of concern. The ELF EMF hazard assessment would be made based on direct comparison of the measured electric and magnetic fields, as they were existed based on the condition of the site at the time of survey, with recognized international standards.

Measurements of the field strengths were carried out using PMM instrument Model 8053 with an attached probe Model EHP-50A (5 Hz – 100kHz) and Emdex II together with a data logger and a reader. The instruments can measure both electric and magnetic fields simultaneously. Readings were taken in miliGauss (mGauss) for the magnetic fields and volt per meter (V/m) for the electric fields. Instruments setup and measurements protocols were adopted from standard measurement method and procedures of US IEEE/ANSI Standard C644 – 1987 and ICNIRP / IRPA Guidelines 1997[1]. The lowest detection limit of PMM instrument is 0.1 mGauss for the magnetic fields and 0.1 V/m for the electric fields, but for Emdex II it is 0.1 mGauss and 10.0 V/m respectively.

Figure 1:Photograph of the site (Location 1)

RESULTS AND DISCUSSION

The survey confirmed that the electromagnetic fields did present at the Location 1 (see Figure 1) within the survey site generated by the high-tension overhead cables. Their presence was measurable at most of the locations, but their strengths varied in non-uniform manner according to location. As expected, areas directly under the cables indicated the presence of much higher field strengths compared to others. However, the overall recorded field strengths were still very much lower than the permissible exposure limit recommended by International Committee on Non-Ionizing Radiation (ICNIRP) and WHO for members of the public.

Both electric and magnetic fields observed within the property of concern were well below the permissible exposure limit recommended for members of the public. The highest level measured here were 0.03% of the limit for the magnetic fields and 5.26% of the limit for the electric fields. The field strengths were further reduced by distance from the cables and in the case of electric fields also by the presence of buildings. The two factors had significantly contributed to the reduction of the magnetic and electric fields inside the houses to 0.2

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mGauss and 2.04 V/m (0.02% and 0.04% of the limit), which were similar to the fields present elsewhere (see Figure 2 and 3).It is expected that the field strengths observed in this survey would remain unchanged so long there are no new cables introduced to the site and the electricity load carried by the cables remains unchanged.

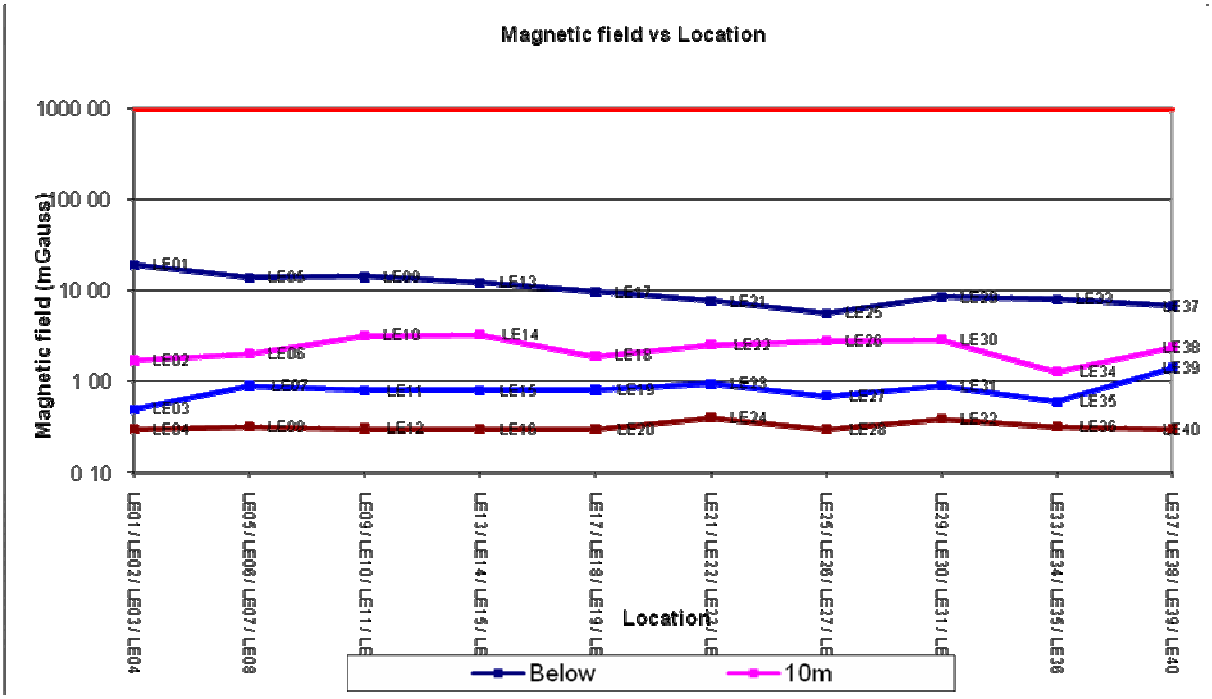

Figure 2: Plot of magnetic field strength vs location in open space along and across the cables

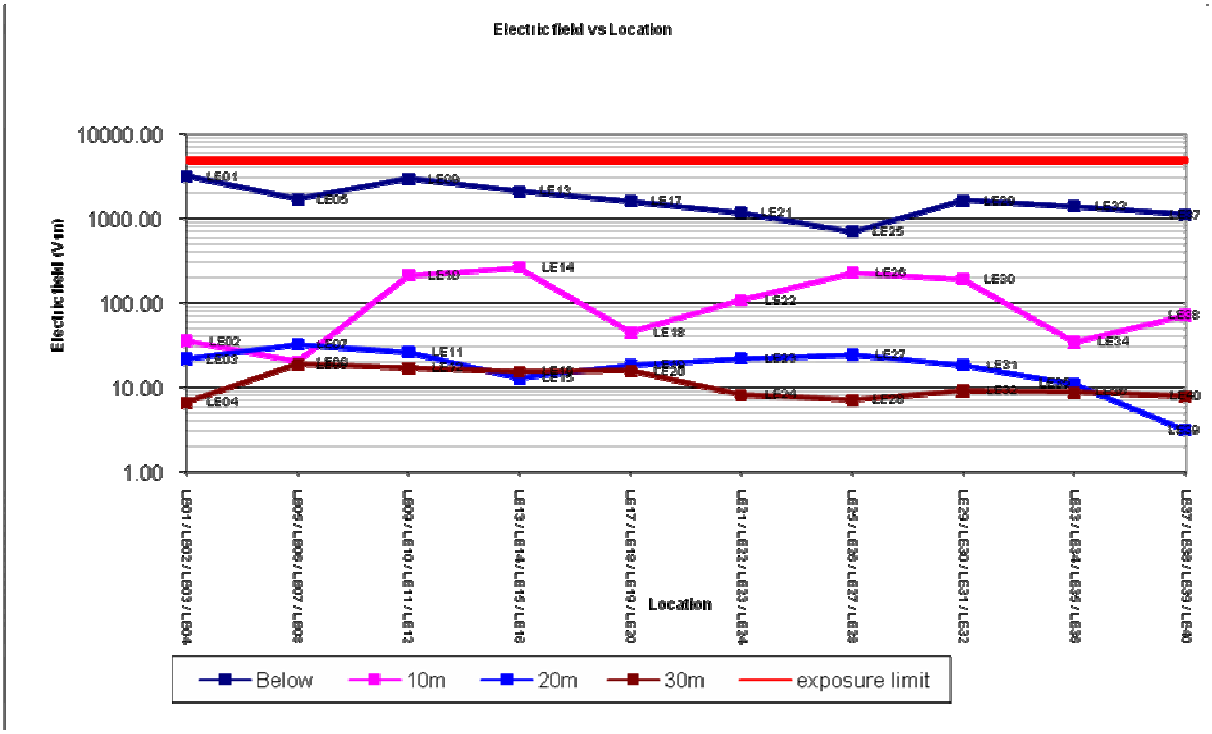

Figure 3: Plot of electric field strength vs location in open space along and across the cables

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Figure 4: Photograph of the site (Location 2)

The results obtained at the Location 2 shows that the electric and magnetic field levels were found to vary against measurement locations, which were strongly influenced by the distance from the substation. The measurement were made in two condition, before and after the residence move into the house. The results for the first measurement condition, shows that the level of both magnetic field and electric field were very low and at most of the location's, the field strengths were below the detection limit (see Figure 5). The maximum magnetic field detected was 0.70 mGauss. During the measurement, the substation is the only source concern because the house was still empty. The field strengths was very low because the area was not fully occupied, so the load of the substation were still very low. This explains why the electromagnetic produced by the substation were very low and most of the time were below the detection limit.

Results of measurement in second condition (after the resident move into the house) also shown in Figure 6. As we can see, at all of the locations selected in the study , the average magnetic field strengths were found to vary between the lowest of <0.10 mGauss (below of the detection limit of the instruments) to the highest of 9.50 mGauss (figure 5). The magnetic fields increased a little bit in the second condition because of the existence other ELF EMF source such as electrical appliances. The highest magnetic field level was captured in front of the television while it ON, which was only 0.95% of the exposure limit recommended by ICNIRP (1000mGauss).

The electric fields were found slightly different manner than the magnetic fields in that they were not only affected distance from the substation, but also by the presence of other objects nearby. This is because the electric fields can easily be absorbed by any conducting object like trees and buildings. Although the field strength was a bit higher at both locations, electric field is not a critical matter as it can be absorbed easily by the wall.

Based on the findings, we could conclude that the presence of ELF EMF within the property of concern generated by the high-tension overhead cables will not lead to any significant exposure received by members of the public staying at the site.

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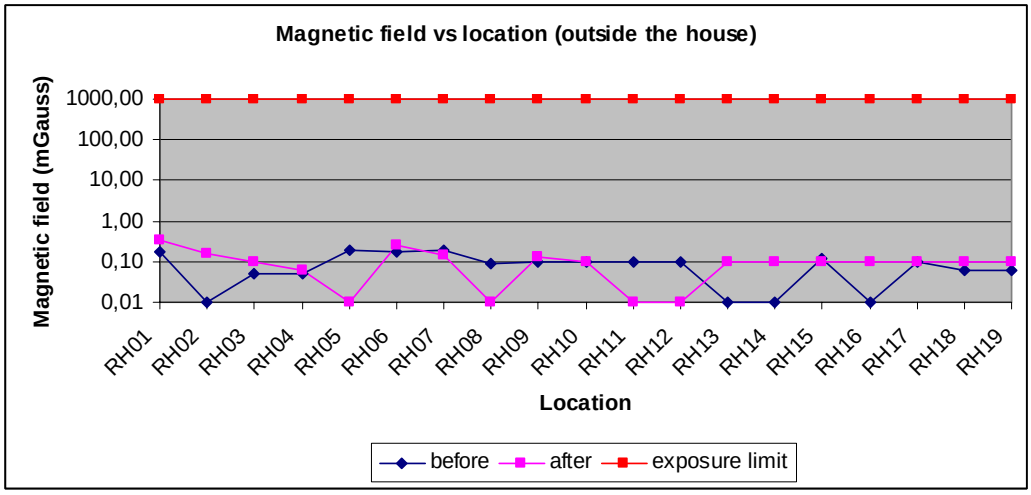

Figure 5: Plot of magnetic field strengths vs location outside the house.

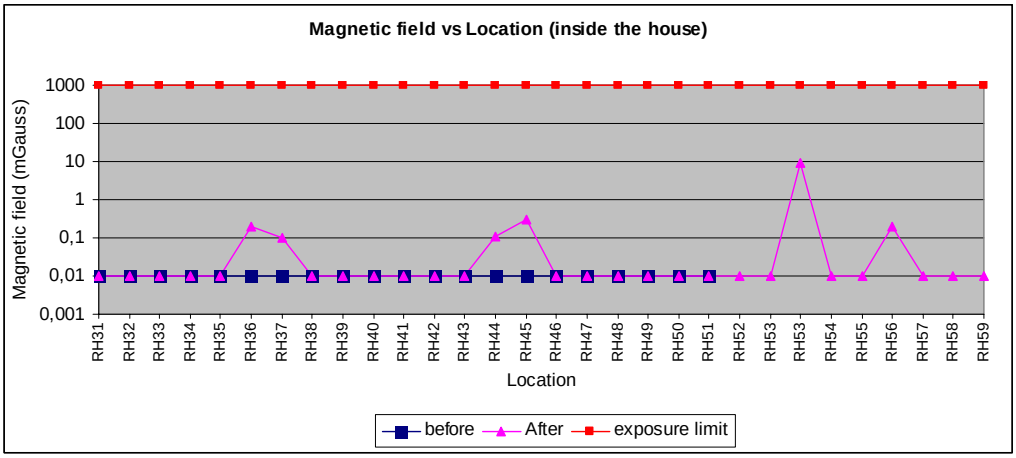

Figure 6: Plot of magnetic field strengths vs location inside the house.

CONCLUSION

Public awareness has a very important role to increase the understanding of knowledge on electromagnetic which categorized as non-ionising radiation. Based on seminars and public talk conducted, public understanding on the electromagnetic exposure has been enhanced. Data collected at the location involved, current knowledge and scientific evidence on the health effects of the ELF EMF exposure available up to this point of time, shows that such low field strengths currently present on the property are deemed to be incapable of causing any observable adverse health effects on exposed persons and can be considered as safe.

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